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ABSTRACT

Using math journals on a weekly basis in second- and third-grade classrooms allows students to proceed at their own rate to converge on an understanding of mathematical concepts using their own experiences. Such journals also provide teachers with a unique diagnostic tool. Students' journal entries regarding telling time and the concept of multiplication illustrate the use of journals in the mathematics classroom: journal writing offers a change of pace for the students and gives teachers a real insight into the workings of the young child's mind in regard to mathematics. (RS)

MATH JOURNALS by Jane Moore

It is common practice today in the elementary school classroom for journaling to occur. Students often journal on a daily basis, filling notebooks with compositions, poetry, dialogues with teachers and assigned essays. The phenomenon called "writing across the curriculum" took educators by storm and many wonderful combinations of social studies, science, and literature were written about.

Writing in mathematics has been a rarer occurrence, but one worth an investigation. Nahrgang and Petersen used mathematics journal on the college level and cited this method as an opportunity for students to "work informally and personally on mathematical concepts, using their own language and real-world experiences" [1] We asked ourselves if this technique might not be appropriate in our 2/3 grade classroom and answered affirmatively. Cynthia Nahrgang names two basic functions of math journals:

> 1) They allow students to proceed at their own rate and converge on an understanding of mathematical concepts using their own experiences.
> 2) They provide teachers with an unique diagnostic tool; the writings of students immediately reveal areas of confusion and expose misunderstandings of mathematical concepts. [2]

In using the math journal, we found that questioning techniques used in response to student writing allowed even second graders to "converge on an understanding."

We began to implement mathematical journal writing in our classroom on a regular basis. We began with the concept of time. We had an activity

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[1] Nahrgang, Cynthia L. and Petersen, Bruce T. "Using Writing to Learn Mathematics," Mathematics Teacher, September 1986, p. 461.

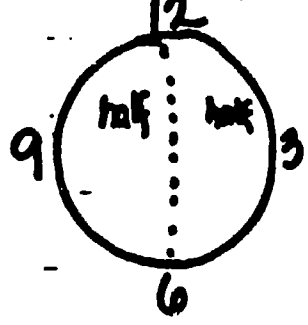
[2] Ibid., p. 463.

day full of time-telling projects and assigned a journal topic of : "Why do we use the terms "half past" and "quarter till" when we tell time? The results were quite fascinating.

half past means say i said half past 11:00 mean 11.30. Because 60 mits in a hour. break in two - youre got 30.

(3rd grade)

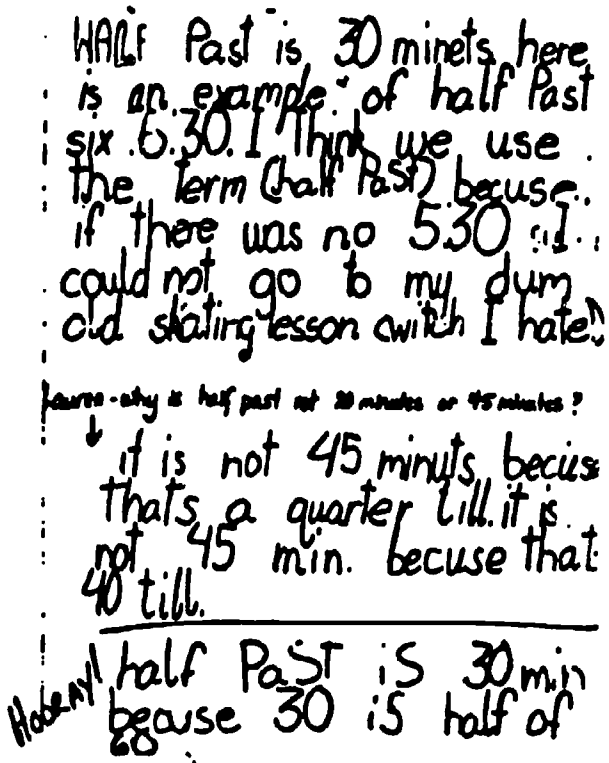
That's true!



Half past and how it got it's name

there are 60 min.'s in a hour. when somebody sais half past, they mean half of 60 min.'s. that's 30 min.'s. 30 min.'s in half an hour. that's how half past got it's name

When student journals were unclear, questioning helped the authors to clarify their ideas. Personal interaction between teacher and student helped children to refine their thinking and sharpen their understandings. (See Figure 2)



Children were asked to write about ideas in time telling that are often taken for granted. We followed the individualized questioning with a paper folding activity. Each child was given a round, paper clock face. They were instructed to match the 3 to the 9 and make the edges even and then fold the clock in half. After all agreed that, in fact, the clock face was folded in halves, we folded again to make 4 equal pieces, or fourths. The children were asked to give another name for "fourth" and someone volunteered "quarter." Then we asked if the "half hour" and "quarter to" phrases made any sense. Some of the children who were unable to articulate this earlier in the journals were able to understand it better using the paper clock.

Two days later we investigated the hypothetical question, "How would the world be different if there were no clocks or watches?" We illustrated part of the problem by covering our classroom clock and confiscating all watches. Most journal entries were simplistic. Children noted that they would not know when school began or when it was time for music. However, in reading further, it became clear that a developmental difference exists at this age level--some children clearly perceive clocks and watches as measurers of time; whereas others see them AS time and feel that when the clocks and watches are removed, time no longer exists. (See Figure 3) **THE FASCINATING ASPECT OF THIS PROCESS IS THE WONDERFUL, CREATIVE WRITING THAT OCCURS. LET ME SHARE ONE SUCH STORY, WRITTEN BY A THIRD GRADER WHO WAS TRYING TO EXPLAIN WHY 5/8 WAS MORE THAN 1/2....**

"Because," I said. "What are we talking about?" said my little brother.
"We are talking about the fact that five eighths is bigger than one half."
"Why is it bigger?" he asked.
"Because!" I shouted.
"OK, OK, OK," said my little brother, "but I still do not understand why it is bigger," he said.
"OK, I will tell you."
"Good."
"You see," I began.
"See what?" he said.
"See nothing. Just listen" (I began to get annoyed.) "OK now," I said to myself.
"Remember that big chocolate bar that you gave me half of?"
"Yea, so what?"
"Suppose I got a candy bar."
"That would be no fair," he said.
"OK," I said. "Well, since I am a good sister, I gave you more than a half."
"Did you give me the whole thing?"
"No," I said.
"How much did you give me?" he said.
"Well, pretend that it was such a big candy bar that there were 8 parts to the candy bar."
"Wow, that's a big candy bar," he said. "How much did you give me?"
"I gave you five parts of the candy bar."
"That is more than I gave you, isn't it?" he said.
"Yes, it is."
"Cool," he said.

The use of the math journal as a diagnostic tool, both for student understanding and for teacher effectiveness was amazing.

Oftentimes we prepare and present a lesson on a given mathematical concept, full of manipulatives, problem solving, and "hands-on" learning The children appear to understand the process and we move on to the next example or concept. But how do we know what they know? We ask them to write about it. After a particularly successful lesson on the concept of multiplication, wherein the students created paper chains in sets of three and then combined them, alternating colors, so as to "see" the sets of three, we asked the students to relate the reason we had completed the project (now hanging in the window to be admired by all)? The responses ranged from "It was a nice decoration," to

> ...multiplication is a quick way for plus. If you had 3 rows of people and there were 7 people in each row, you could say 7 x 3 or 3 x 7 which would equal the same thing--21! ...the chains on the window could help someone if they didn't understand times tables.

As a teacher, pleased with a lesson which addressed a concept through a fun activity, it was quite an eye-opener to discover that the "whole point" had been missed by many students. Further explanation proved beneficial for all concerned. About a week later, a math journal was assigned to third graders concerning two grocery carts which were illustrated on the board. One contained seven items all priced identically; the other contained seven items of varying prices. The children were asked to explain in which case they would use multiplication to solve the total cost of the cart and why. The way in which the explanations were given gave us a good perception of the individual student's understanding and ability to

apply the concept. In working with second graders on strategies for learning addition facts, we asked them to set forth their own methods of solving problems:

> Since I've memorized my doubles, I use them to figure out problems. Like when I see 9 + 7, I say, 9 + 9 - 2 = 16, and that's my answer.
> Since I also know stuff like counting forward and backward, I do that in my head. 11 + 12 is also easy, if you know your doubles!

We have been using math journals on a weekly basis. The journal writing replaces the daily self-directed writing that the children do. It's a change of pace for them and for us and has given us real insight into the workings of the young child's mind in regard to mathematics.